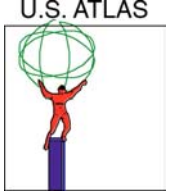


3.4 Tile Calorimeter Maintenance and Operations

DOE/NSF Review

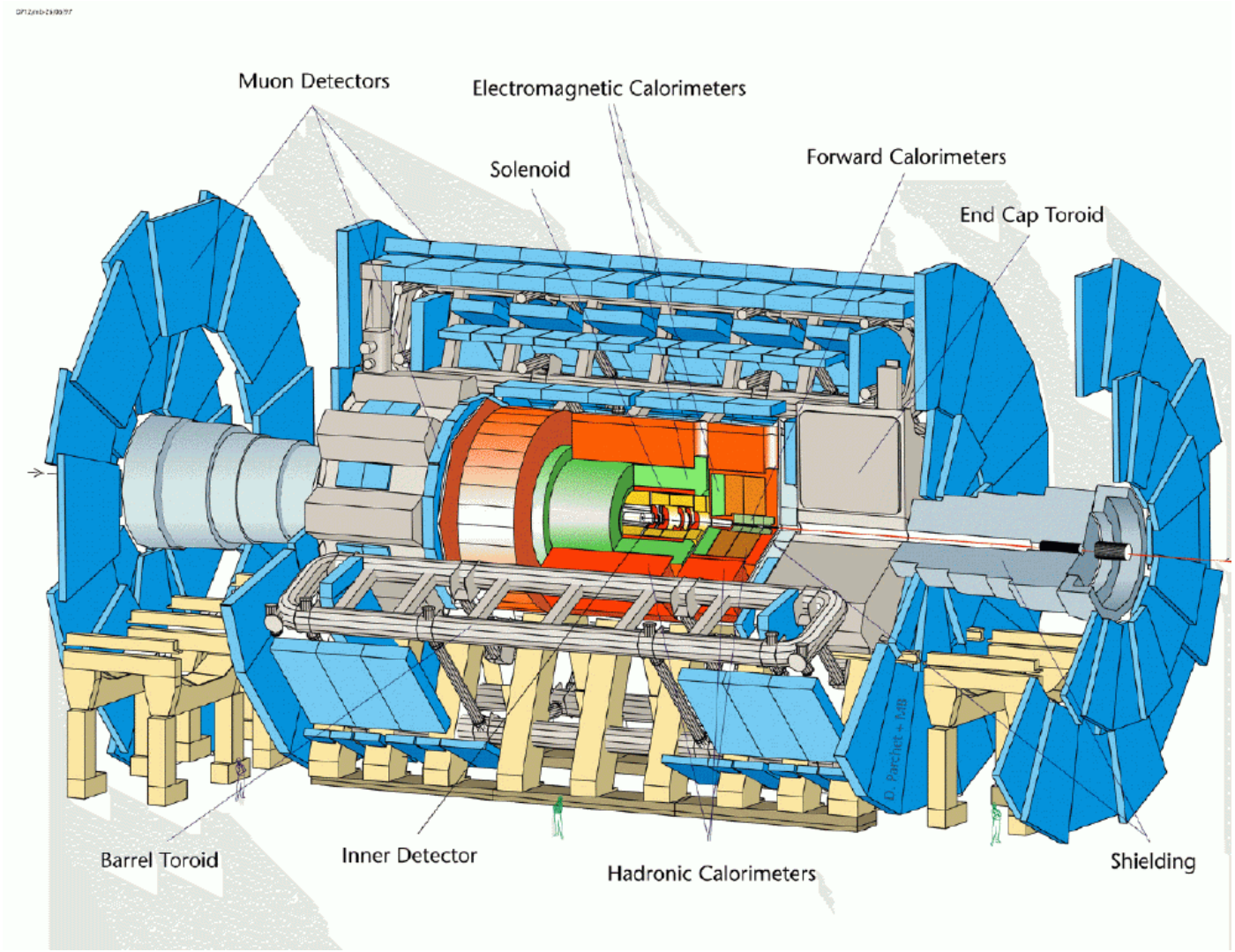
April 11 2002, FNAL

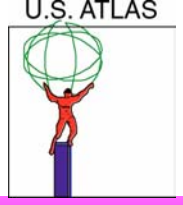
Larry Price

ANL

U.S. ATLAS

Tilecal in ATLAS





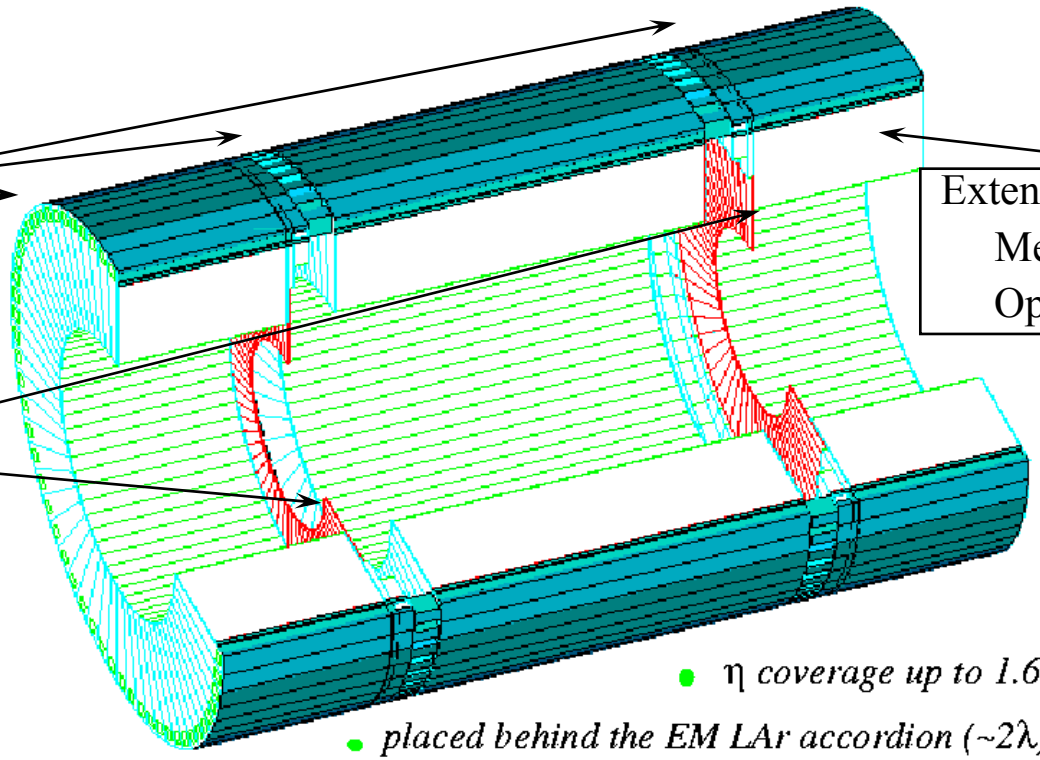
Tilecal US Deliverables

- Mechanical design 1.4.1.1.1, 1.4.1.2.1, 1.4.1.2.4, 1.4.1.3.1
- Tooling, Prototypes 1.4.1.3, 1.4.2.3
- Optical components R&D 1.4.2.1.1, 1.4.2.2.1
- Master Plates 1.4.1.1.3.2.1-3
- Scintillator Wrappers 1.4.2.1.3.1
- Assembly and testing of 1 Extended Barrel Calorimeter 1.4.1, 1.4.2
- Electronics design and prototypes 1.4.3.x.1-2
- Front-end electronics 1.4.3.2-4
- 1/3 of PMTs 1.4.3.1, 1.4.4.1
- Intermediate Tile Calorimeter 1.4.4

ATLAS Tile Calorimeter (1.4)

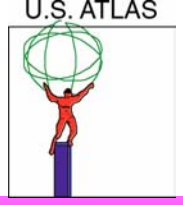
Readout system in Girder 1.4.3

Intermediate Tile Calorimeter 1.4.4



Extended Barrel Calorimeter
Mechanics 1.4.1
Optics 1.4.2

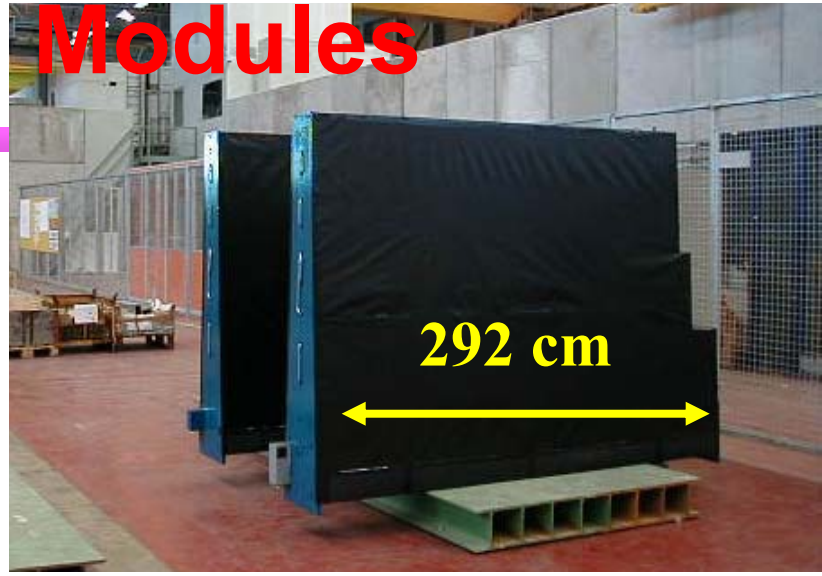
- *η coverage up to 1.6*
- *placed behind the EM LAr accordion (~2λ)*
- *outer diameter 8.5 m, 12.2 m long, 2900 tons, 64 wedges structure*
- *Fe-scintillator sampling calorimeter (ratio ~4:1), WLS fibres readout*
- *unconventional scintillator geometry, with tiles in the radial direction*
- *the calorimeter body and the massive iron outer support act as magnetic flux return for internal solenoid*



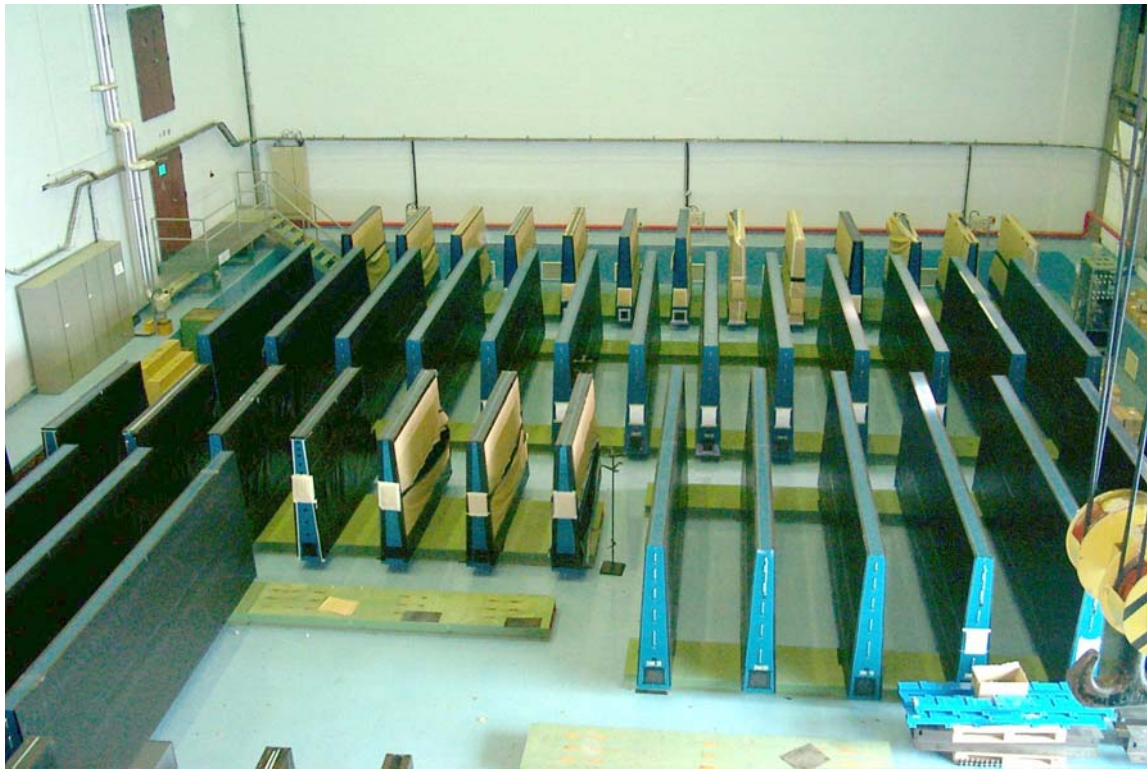
U.S. Tilecal Institutions

- Argonne National Lab
  - Submodules, modules, instrumentation, engineering
- University of Chicago
  - Submodules, electronics
- University of Illinois
  - Submodules, PMTs
- Michigan State University
  - Scintillator wrappers, instrumentation, cryo scint.
- University of Texas at Arlington
  - ITC submodules and scintillator

Extended Barrel Modules



- 64 modules make up one EB
  - Incorporates steel, assembly, instrumentation, and ITC submodule deliverables
  - Modules are tested with led and /or Cs source illuminating all tiles before shipping

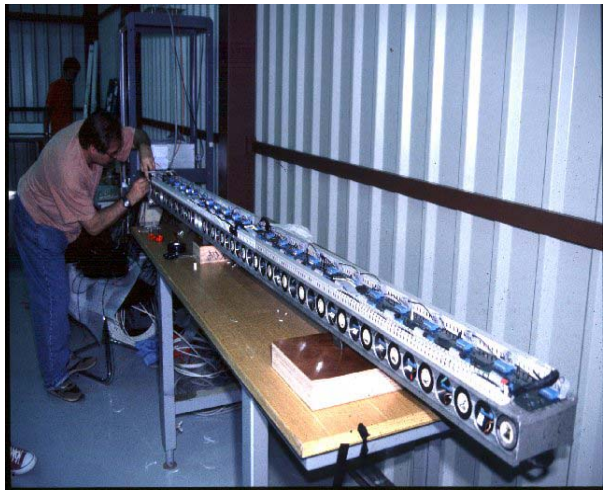


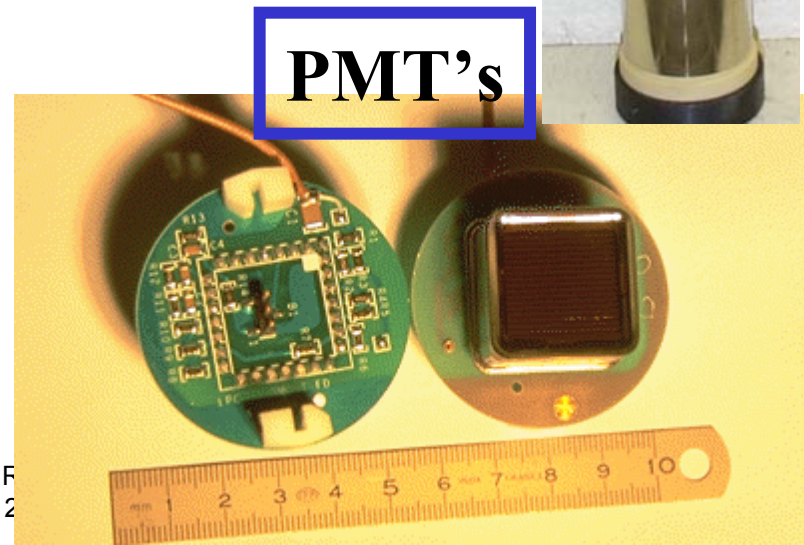
Module Construction Status

- 1.4.1 Mechanics
  - Submodules 97% complete
    - UI and UC work is complete
  - 49 of 64 modules mech. assembled
    - 43 instrumented and tested; 38 shipped
  - All parts are on hand for completion after recent shipment of girders
- 1.4.2 Instrumentation
  - 43 modules have been instrumented and tested
  - 38 have been shipped to CERN
  - Move to new building at MSU will produce a month's delay
  - Fibers continue to arrive (from Lisbon) about 1 month before needed

Technical Status

- 1.4.3 Readout
  - STEP2 (pulsed) light testing of PMTs started in January
  - STEP 1 continuing routinely at UI and UTA
  - Front end 3-in-1 cards all tested.
    - 6% need (mostly minor) repairs
  - Mother Boards all delivered and 25% tested
  - Optical Interface Cards: about to let contract for assembly in Taiwan
    - All parts on had except optical transmitters coming from Taiwan
    - PRR completed in November

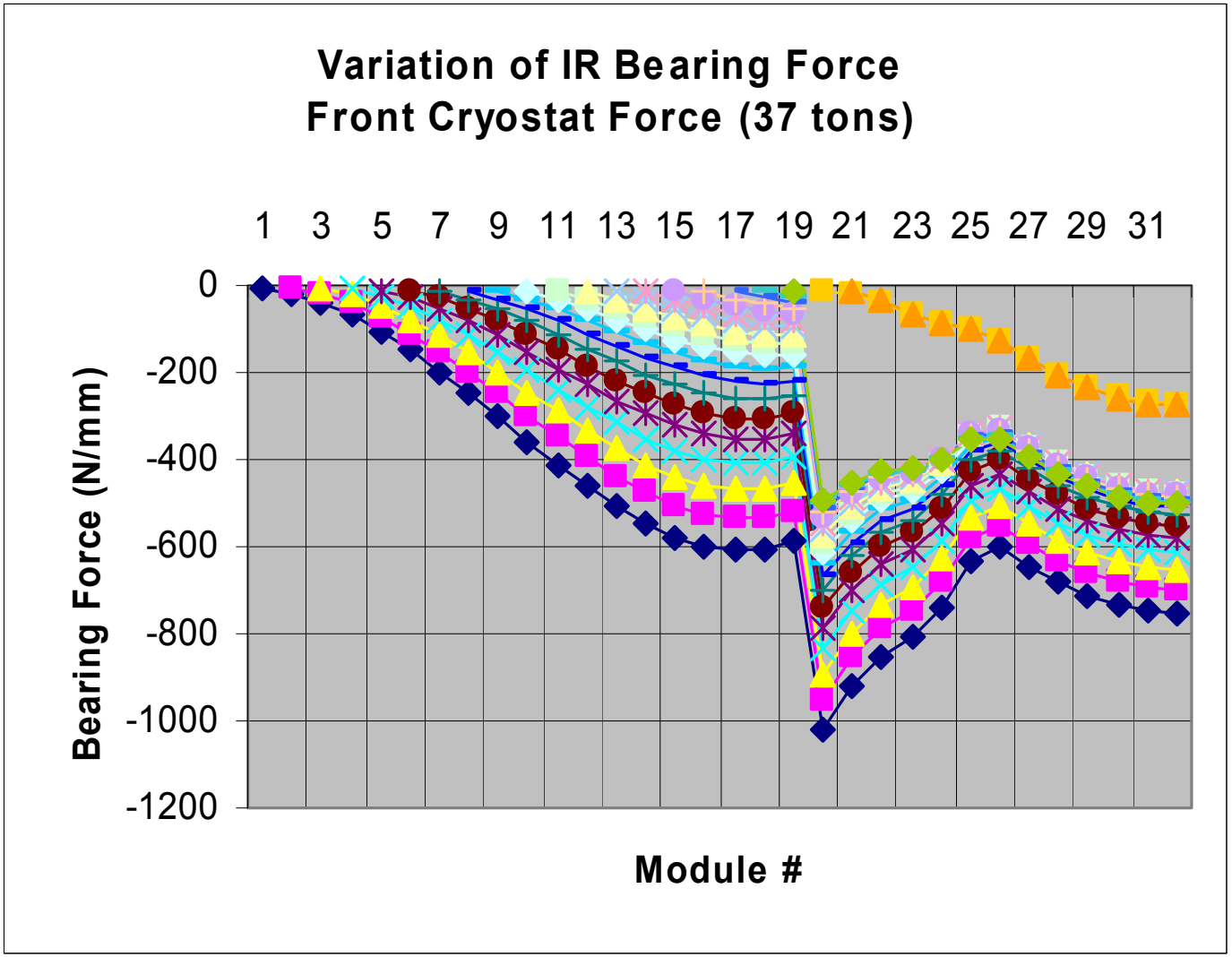




Technical Status

- 1.4.4 Intermediate Tile Calorimeter
  - 110 ITC Submodules shipped to ANL and Barcelona
  - About to place order for gap scintillator
  - Final drawings made for approval of crack (cryostat) scintillator boxes

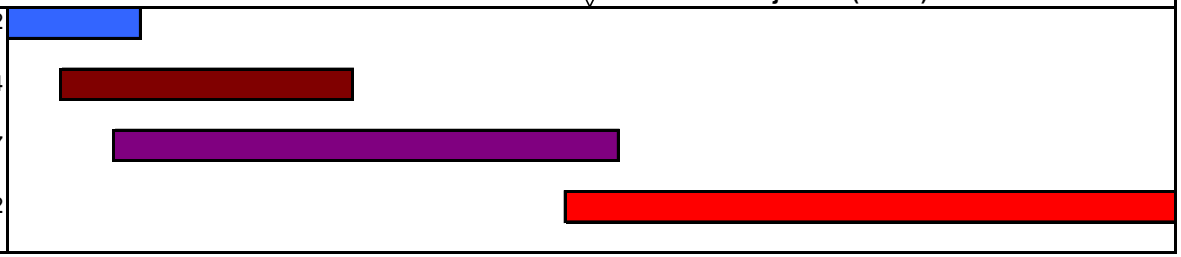
Engineering and Structural Analysis

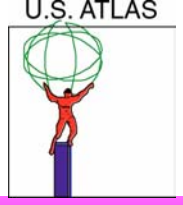


Schedule

U.S. ATLAS
Level 2
Construction/Research Program Transition Schedule

Subsystem	Category	Start Date	Compl Date
Tile	Construction	N/A	12/2/02
	Installation	6/3/02	12/3/04
	Pre-Operations	10/1/02	6/30/07
	Operations	1/2/07	9/28/12

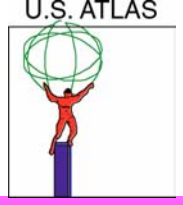




Pre-Operations Schedule

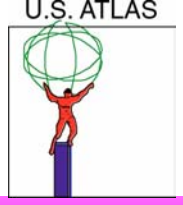
- Preassembly EBC 4/02 – 11/02
- Preassemby Barrel 12/02 - 6/03
- Preassembly EBA 7/03 - 11/03

- (Install Barrel-EBC-EBA 12/03 – 11/04)



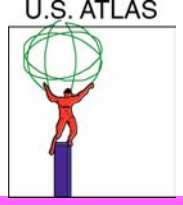
Work for Pre-Operations

- Source testing and calibration
- Beam test 8 modules x 3 sections
  - 2002-2004
  - Modest US technical support
- Preassembly
  - Engineering (US provides 1 FTE of 3)
  - Technicians (US provides 1.5 FTE of 7)
- Support design and analysis
  - 0.7 FTE-yr Engineer (half already done)
  - 0.3 FTE-yr Designer (half done)
- Support procurement
  - 0.2 FTE Engineer



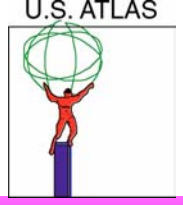
Work for Pre-Operations

- Beam test 8 modules x 3 sections
  - 2002-2004
  - Modest US technical support
- Cosmic ray data taking and analysis
  - All physicists?
- Electronics validation and calibration
  - Repairs (engineer, technicians)
- Software development and testing
  - Computer professionals



Work for M&O

- Mechanical support of endcap moving and access
  - Engineers, technicians
- Electronics validation and calibration
  - Repairs
  - Access to electronics drawers during shutdowns
- PMT testing and replacement
  - Technician
- Testbeam support and operations
  - Modest US technical support
- Software support of operations and testbeam
  - Computer professionals



U.S. ATLAS M&O Estimate
Tile WBS Level 4 Profile

Funding Source: All | Funding Type: Program | 4/3/02 8:20:42 AM

Institutions: All | Labor/Material: Both

WBS Number	Description	FY 03 (k$)	FY 04 (k$)	FY 05 (k$)	FY 06 (k$)	FY 07 (k$)	FY 08 (k$)	FY 09 (k$)	FY 10 (k$)	FY 11 (k$)	FY 12 (k$)
3	U.S. ATLAS M&O Estimate	924	875	1158	807	772	782	780	779	779	779
3.4	Tile Calorimeter System	924	875	1158	807	772	782	780	779	779	779
3.4.1	Tile Calorimeter System-Specific Cos	840	777	996	761	570	570	570	570	570	570
3.4.1.1	Pre-Operations & Commissioning	840	777	996	130	0	0	0	0	0	0
3.4.1.2	Operations (Beam-on)	0	0	0	331	319	319	319	319	319	319
3.4.1.3	Maintenance (Beam-off)	0	0	0	300	251	251	251	251	251	251
3.4.2	Calibration & Monitoring	67	81	145	30	23	23	23	23	23	23
3.4.2.1	Pre-Operations & Commissioning	67	81	145	7	0	0	0	0	0	0
3.4.2.2	Operations (Beam-on)	0	0	0	23	23	23	23	23	23	23
3.4.2.3	Maintenance (Beam-off)	0	0	0	0	0	0	0	0	0	0
3.4.3	Tilecal System Common Costs	18	18	18	16	180	189	187	186	186	186
3.4.3.1	Pre-operations	18	18	18	16	0	0	0	0	0	0
3.4.3.2	Operations	0	0	0	0	180	189	187	186	186	186
3.4.3.3	Maintenance	0	0	0	0	0	0	0	0	0	0

Page 1 of 1

Effort M&O Summary FTEs by FY Research Program

MANPOWER ESTIMATE SUMMARY IN FTEs

WBSNo: 3.4 | Funding Type: Program | 4/1/2002 6:09:34 PM

Description: Tile Calorimeter System | Institutions: All | Funding Source : All

	FY03	*FY04*	*FY05*	*FY06*	*FY07*	*FY08*	*FY09*	*FY10*	*FY11*	*FY12*
Faculty										
Sr Research										
Term Scientist										
Post Doc										
Grad Student										
Mechanical Engineer	.7	.1		.5	.2	.2	.2	.2	.2	.2
Electrical Engineer	.6	.7	1.1	.5	.2	.2	.2	.2	.2	.2
Technician	4.0	3.8	5.8	2.4	1.9	1.9	1.9	1.9	1.9	1.9
Computer	.2	.8	1.4	1.8	1.3	1.3	1.3	1.3	1.3	1.3
Designer	.2									
Adminsitrator										
Contract Labor										
TOTAL LABOR	5.7	5.3	8.2	5.1	3.6	3.6	3.6	3.6	3.6	3.6

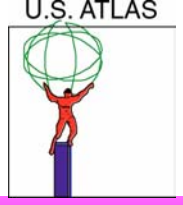
Effort Summary FTEs by FY Base/Infrastructure

MANPOWER ESTIMATE SUMMARY IN FTEs

WBSNo: 3.4 | Funding Type: Base+Infrastructure | 4/1/2002 6:10:21 PM

Description: Tile Calorimeter System | Institutions: All | Funding Source : All

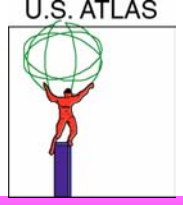
	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12
Faculty	.3	1.5	2.8	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Sr Research	.6	.8	1.4	1.8	1.3	1.3	1.3	1.3	1.3	1.3
Term Scientist				1.0						
Post Doc	.2	2.2	5.4	8.3	8.0	8.0	8.0	8.0	8.0	8.0
Grad Student										
Mechanical Engineer										
Electrical Engineer										
Technician										
Computer										
Designer										
Adminsitrator										
Contract Labor										
TOTAL LABOR	1.2	4.5	9.5	13.5	11.8	11.8	11.8	11.8	11.8	11.8



Tilecal PreOps has Begun!

- Beam testing of 1/8 of modules
- Calorimeter Preassembly
- Module validation and calibration with Cs source

- Vital work (and funding) is needed in FY 2002-2004



Summary

- PreOps starting NOW with preassembly and calibration
- Continued support is needed in 2003 for preassembly and test beam
- M&O will continue in 2004 with test beam and electronics testing
- 2005-2006 cosmic ray testing
- 2007-on Operations: readout maintenance and test beam work will dominate